ANNUAL REPORT 1964

WATERLOO

water pollution control plant

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NOV 25 1965
ONTARIO WATER
RESOURCES COMMISSION

DIVISION OF PLANT OPERATIONS

Ontario Water Resources Commission

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ONTARIO WATER RESOURCES COMMISSION
OFFICE OF THE GENERAL MANAGER

Members of the Waterloo Local Advisory Committee,
City of Waterloo.

Gentlemen:

We are pleased to provide you with the 1964 Operating Report for the Waterloo Water Pollution Control Plant, OWRC Project No. 58-S-22.

By continuing the mutual cooperation which has existed in the past, we can look forward to greater progress in the field of water pollution control.

Yours very truly,

D S Caverly

D. S. Caverly,
General Manager

General Manager,
Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Waterloo Water Pollution Control Plant, OWRC Project No. 58-S-22 for 1964.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

BCPalmer

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report describes the operation of this project for the year 1964. It includes a detailed description of the project, summary of operation, graphs and charts showing quality and quantity information, and project cost data.

This information will be of value to the municipality in assessing the adequacy of the works in meeting existing requirements and in projecting its capability to meet future expected demands. The cost information will be of particular interest to those concerned with developing and maintaining revenue structures.

The preparation of this report has been a cooperative effort of several groups within the Division of Plant Operations. These include the Statistical Section, Brochures Officer and the Regional Supervisor. However, the primary responsibility for the content has been with the Regional Operations Engineer. He will be pleased to discuss all aspects of this report with the municipality.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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WATERLOO
water pollution control plant

operated for

THE CITY OF WATERLOO

by the

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Regional Supervisor: D. A. McTavish
Operations Engineer: B. G. Porter

801 Bay Street Toronto 5

'64 REVIEW

This report presents in detail significant data on the operation of the various treatment units at the Waterloo Water Pollution Control Plant.

The average daily flow during 1964 was 2.34 million gallons which is an increase of 12.0 percent over the average daily flow of 2.09 million gallons during 1963. On investigating figure No. 2, it can be seen that there has been a small, but steady increase in flow over the past four years. The average daily flow has increased from 1.71 million gallons per day in 1961 to an average daily flow of 2.34 million gallons in 1964. This is not uncommon and reflects the growth and development of the City of Waterloo.

The organic loadings and pH fluctuations at this project were completely beyond the capability of the plant throughout 1964. As has been mentioned, since 1961 the average BOD concentration for any month has always been greater than the design of 300 parts per million. In fact during 1963 and 1964 the average BOD concentrations exceeded twice the design figure.

The high organic loadings have resulted in high volumes of excess activated sludge in the process. Part of the excess activated sludge which is normally wasted to the primary clarifier had to be directed to the receiving stream with the plant effluent. This however, ceased in June when a contractor was engaged to haul the excess liquid sludge that could not be filtered.

The average BOD and suspended solids removals of 85.5 percent and 83.1 percent respectively indicate that the plant is operating below the 90 to 95 percent efficiency normally obtained with this type of treatment. In addition the effluent falls far short of the Commission objective of 15 ppm BOD and suspended solids. These conditions reflect the overloading and poor quality waste that the plant must treat.

The operating costs for the plant have continued to increase due to the increased cost of labour, supplies and maintenance. Maintenance costs are rising at a rapid rate because most of the equipment must operate continually to combat the plant overloading.

The plant staff, under the supervision of head office engineers, constantly attempt to obtain the most efficient treatment under the prevailing conditions.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY

1956 - 1964

INCEPTION

In 1956, the City of Waterloo and the Ontario Water Resources Commission initiated plans to provide secondary treatment additions to the Waterloo Water Pollution Control Plant.

The firm of Proctor and Redfern, Toronto, Ontario, Consulting Engineers, was engaged to prepare plans and specifications for the project.

APPROVAL

On January 24, 1958, the Ontario Municipal Board granted approval for the plant extensions and the city signed an agreement with the Ontario Water Resources Commission to finance, construct and operate the plant.

CONSTRUCTION

Ball Brothers Construction Company, Kitchener, Ontario, began construction in 1959 and by April of 1960, the Division of Plant Operations assumed the responsibility of operating the new plant.

TOTAL COST

$690,029.00

E. H. HAY
CHIEF OPERATOR

Project Staff

Maintenance Technician - R. Sellence

Operators

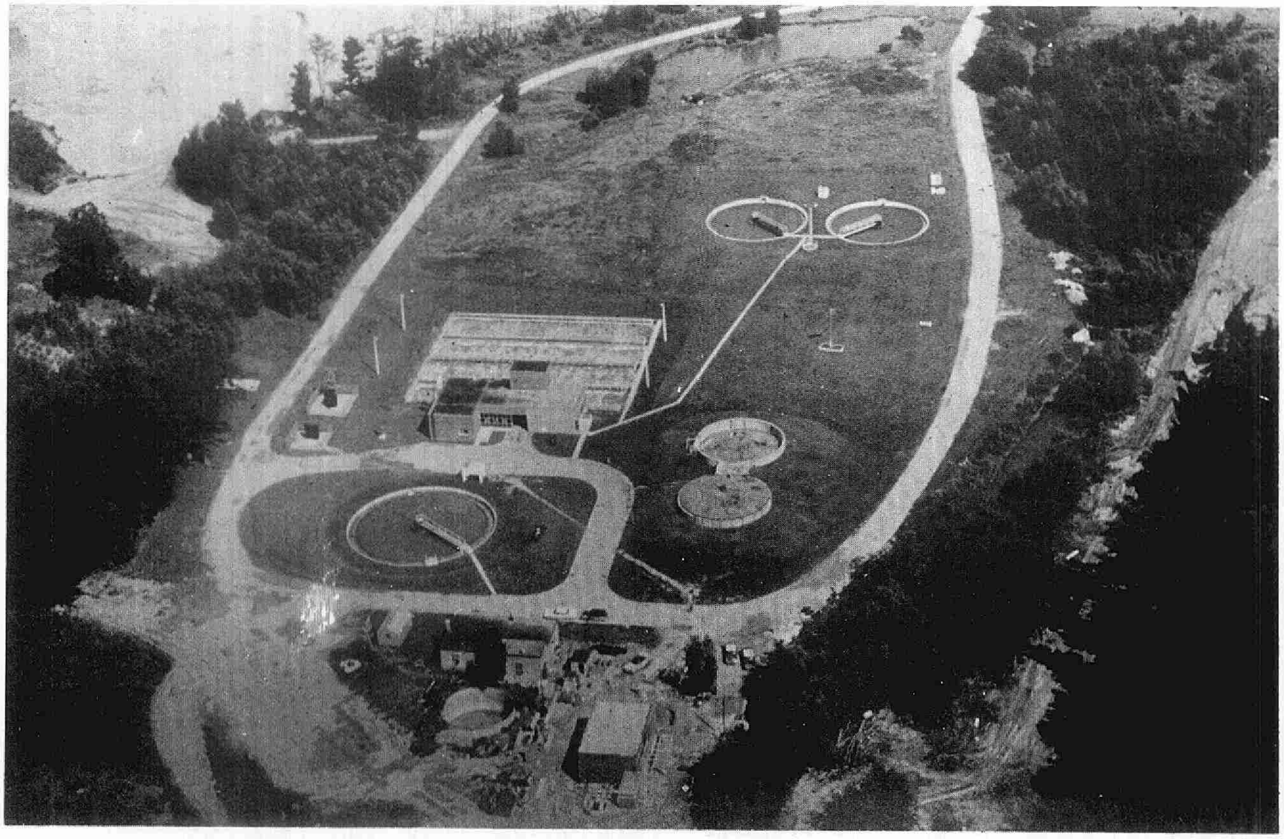
A. Franz
F. Hamer
B. E. Snider
R. R. Gellatly
R. D. Matthews
D. M. Coates

COMMENTS

The plant is staffed 16 hours per day, 7 days per week between the hours of 7 a.m. and 11 p.m. The total staff compliment is 8 men.

The position of maintenance technician was created in order to more efficiently handle the rising maintenance work load. Mr. Sellence was appointed to this position in July 1964, causing a vacancy in the operational staff, therefore, Mr. Coates an experienced operator from the Owen Sound Water Pollution Control Plant, filled this position in September 1964.

Mr. Gellatly received his Certificate of Qualification as Sewage works Operator in 1964 after successfully completing a series of three, one week duration courses of instruction, in Toronto, sponsored by the OWRC.



Description of Project

INFLUENT WORKS

Flow enters the plant from a new pumping station located at the plant site. This station receives sewage via two trunk sewers and provides comminution. Flow enters the detritor room through a mechanically cleaned bar screen and is directed to an 18" Parshall flume where the flow quantity is measured and recorded. A twelve foot square detritor provides 30 seconds retention at design flow to remove non-organic solids. The sand and grit settled out is removed by a mechanical raking mechanism to a wheelbarrow and is buried on the plant grounds.

PRIMARY SEDIMENTATION

A 75 foot diameter concrete clarifier receives sewage from the grit removal unit. The clarifier has a 9 foot side wall depth with a 12 foot depth at the centre. A retention period of 1.66 hours at design flow allows settleable solids in the incoming sewage to settle to the bottom of the tank. A circular scraper mechanism removes the settled sludge to a central hopper from where it is pumped to vacuum filtration facilities.

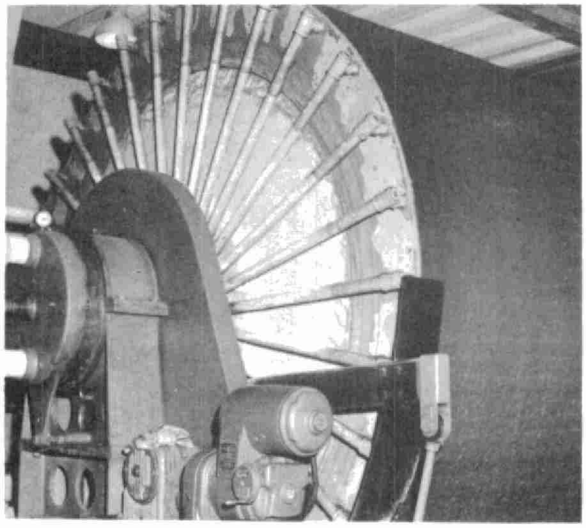
AERATION

Four single pass aeration tanks with a total volume of 1.5 million gallons provides 7.2 hours retention at design flow and 25% return sludge. Each tank is 136 ft. x 30 ft. with a 15 ft. side wall depth. Air is supplied by two air compressors each rated at 3,750 cubic feet of air per minute.

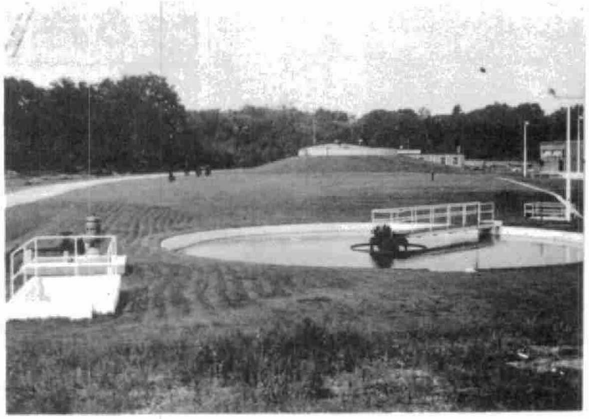
Aerobic digestion of suspended and dissolved solids results from the action of the activated sludge in the presence of oxygen.

FINAL SEDIMENTATION

Two 65 foot diameter circular concrete final clarifiers with a 10 foot side wall depth receive the mixed liquor from the aeration section. Each tank has a volume of 230,000 Imperial gallons and together they provide 2.75 hours retention at design flow. The flocculant activated sludge settles out in these clarifiers leaving a clear effluent which overflows a peripheral weir, is chlorinated and is directed to the Grand River.



VACUUM FILTER



FINAL CLARIFIER; CHLORINE CHAMBER AT LEFT

The activated sludge is collected by circular mechanisms and a portion of it is returned to feed the aeration process.

Excess activated sludge is wasted to the primary clarifier and is filtered with the raw sludge.

VACUUM FILTER

Waste activated and raw sludge are stored in the primary clarifier and pumped to the vacuum filtering unit. This unit is a 300 square foot Komline-Sanderson stainless steel coil spring vacuum filter. The filter drum is placed under a vacuum and moisture is drawn from the sludge. Lime and ferric chloride solutions are used to coagulate the sludge solids prior to filtration. The concentrated sludge is hauled to farmland and sanitary landfill areas by truck. The moisture removed is returned to the aeration section to be treated biologically.

CHLORINE CONTACT CHAMBER

Chlorination is practiced to disinfect harmful bacteria in the effluent. A chlorine residual of 0.5 PPM after 15 minutes of contact time is maintained.

PROJECT COSTS

STAGE I

LONG TERM DEBT: (Total Capital Cost)	$728,676.00

The total cost to the municipality during 1964 was as follows:

Net Operating	$112,363.46
Debt Retirement	26,426.00
Reserve	6,081.00
Interest Charged	40,995.48
TOTAL	$185,865.94

RESERVE ACCOUNT

Balance at January 1, 1964	$ 14,131.38
Deposited by municipality	6,081.00
Interest Earned	883,38
	$ 21,095.76
Less Expenditures	3,379.06
Balance at December 1, 1964	$ 17,716.70

DEBT OUTSTANDING:	$613.675.21

STAGE II

LONG TERM DEBT: (Total Capital Cost)	$13,226.00

The total cost to the municipality during 1964 was as follows:

Net Operating	$ -
Debt Retirement	552.00
Reserve	172.00
Interest Charged	743.18
TOTAL	$ 1,467.18

RESERVE ACCOUNT

Balance at January 1, 1964	$ 174,02
Deposited by municipality	172.00
Interest Charged	12.84
	$ 358.86
Less Expenditures	-
Balance at December 1, 1964	$ 358.86

DEBT OUTSTANDING:	$12,081.28

MONTHLY COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	* SUNDRY
JAN	4856.67	2416.94	181.40	215.25	1666.05	230.96	56.36		63.86	25.85
FEB	7282.43	2406.29			1920.91	2111.85	164.74		124.01	554.63
MARCH	5000.37	2545.47		215.97	1581.45	(219.04)	29.70		283.69	563.13
APRIL	8661.48	2538.97		373.10	1833.22	2903.84	88.86		276.60	646.89
MAY	14376.16	3764.09	374.06	309.50	1839.22	1847.80	168.00	614.59	402.94	5055.96
JUNE	5975.58	2885.23	599.55	164.74	1885.11	(1605.41)	94.58	749.61	408.38	793.79
JULY	13612.74	2464.15	573.15		1757.08	6795.05	278.70	201.09	353.78	1189.74
AUG	8256.51	2515.29	539.67		1600.06	1806.73	186.90	77.06	361.68	1169.12
SEPT	13223.35	3149.71	549.49		1833.40	6203.59	178.95	280.63	126.42	901.16
OCT	6510.97	2969.80	134.05		1565.01	(1511.42)	163.04	3.92	587.57	2599.00
NOV	9290.75	2951.34			1562.37	1507.09	305.86	129.69	432.28	2402.22
DEC	15316.45	4445.47		457.27	3535.24	980.76	198.60	160.34	1399.95	4138.82
TOTAL	112363.46	35052.75	2951.37	1735.83	22579.02	21051.80	1914.29	2216.93	4821.16	20040.31

* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE $13,715.66

BRACKETS INDICATE CREDIT

YEARLY COSTS

YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1961	599.373	$80,710	* $14.20	$134.25	
1962	736.953	86,442	15.17	117.30	2 CENTS
1963	762.446	96,410	15.87	126.45	2 CENTS
1964	852.937	112,363	18.72	131.74	2 CENTS

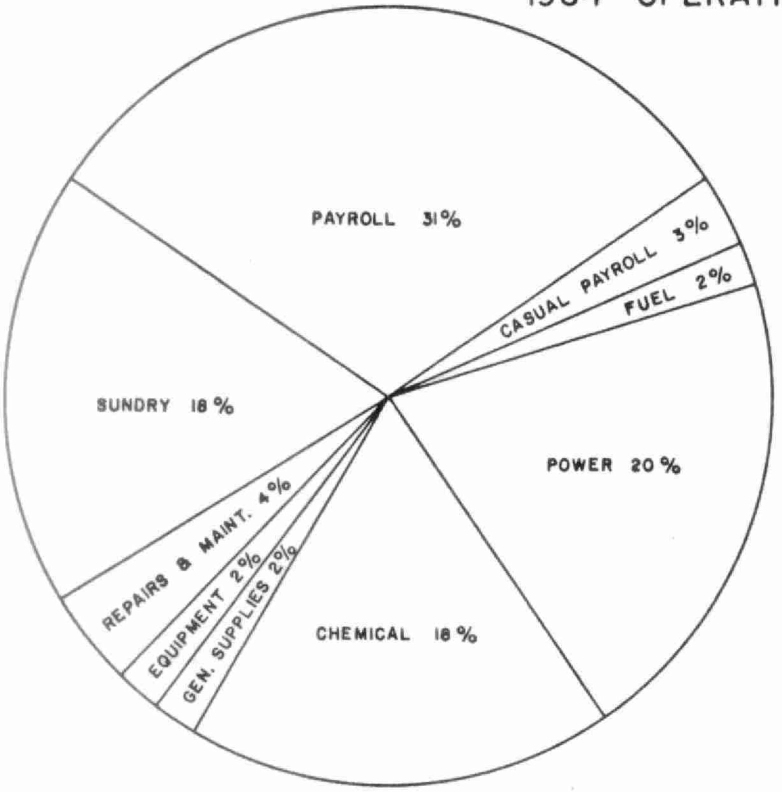
* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

VACUUM FILTER *MONTHLY*

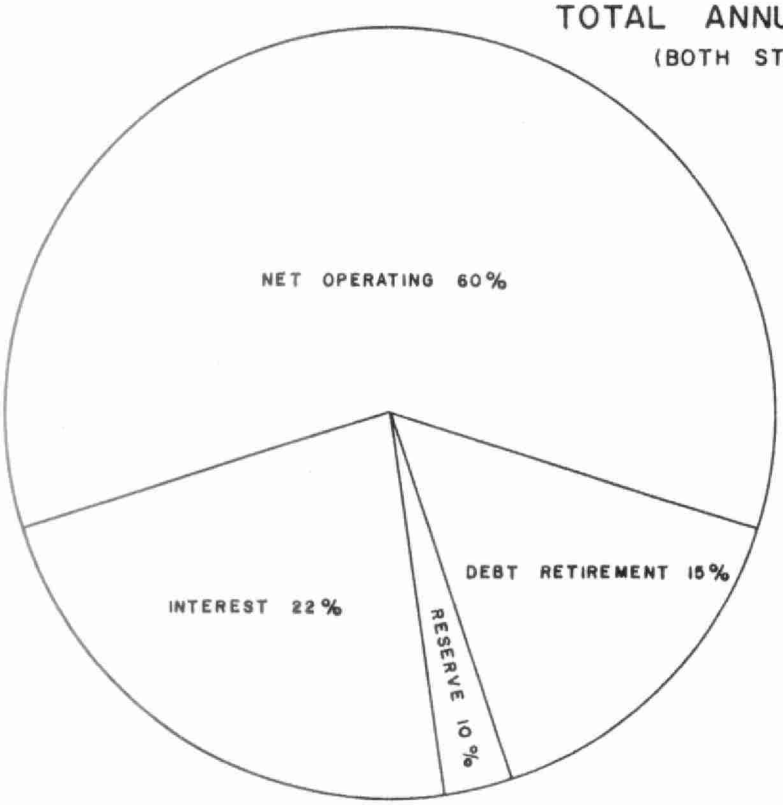
MONTH	COST PER MONTH					ACCUMU-LATIVE TOTAL	COST PER TON DRY WEIGHT					ACCUMU-LATIVE TOTAL
	$FeCl_3$	LIME	LABOUR	ELEC	MAINT		$FeCl_3$	LIME	LABOUR	ELEC	MAINT	
JANUARY	414	252	448	142	125	1381	2.91	1.77	3.14	1.00	0.88	9.70
FEBRUARY	525	340	581	180	125	1751	2.92	1.89	3.23	1.00	0.69	9.73
MARCH	663	432	662	204	125	2086	3.25	2.12	3.25	1.00	0.61	10.23
APRIL	427	375	684	267	125	1878	1.60	1.40	2.56	1.00	0.47	7.02
MAY	694	406	713	283	125	2221	2.45	1.43	2.52	1.00	0.44	7.84
JUNE	788	445	735	281	125	2374	2.80	1.58	2.62	1.00	0.44	8.45
JULY	740	396	676	206	125	2143	3.59	1.92	3.28	1.00	0.61	10.41
AUGUST	738	392	662	227	125	2144	3.26	1.73	2.92	1.00	0.55	9.46
SEPTEMBER	644	318	529	173	125	1789	3.73	1.84	3.07	1.00	0.72	10.37
OCTOBER	554	365	573	122	125	1739	4.54	2.99	4.70	1.00	1.02	14.26
NOVEMBER	500	314	522	119	125	1580	4.20	2.64	4.38	1.00	1.05	13.27
DECEMBER	720	375	565	156	125	1941	4.62	2.41	3.63	1.00	0.80	12.46
TOTAL	7407	4410	7350	2360	1500	23027						
AVERAGE PER MONTH	617	368	612	197	125	1920	3.14	1.87	3.12	1.00	0.64	9.76

COMMENTS

Vacuum filtration operation during 1964 cost $23,027 or $9.76 per ton of dry solids.

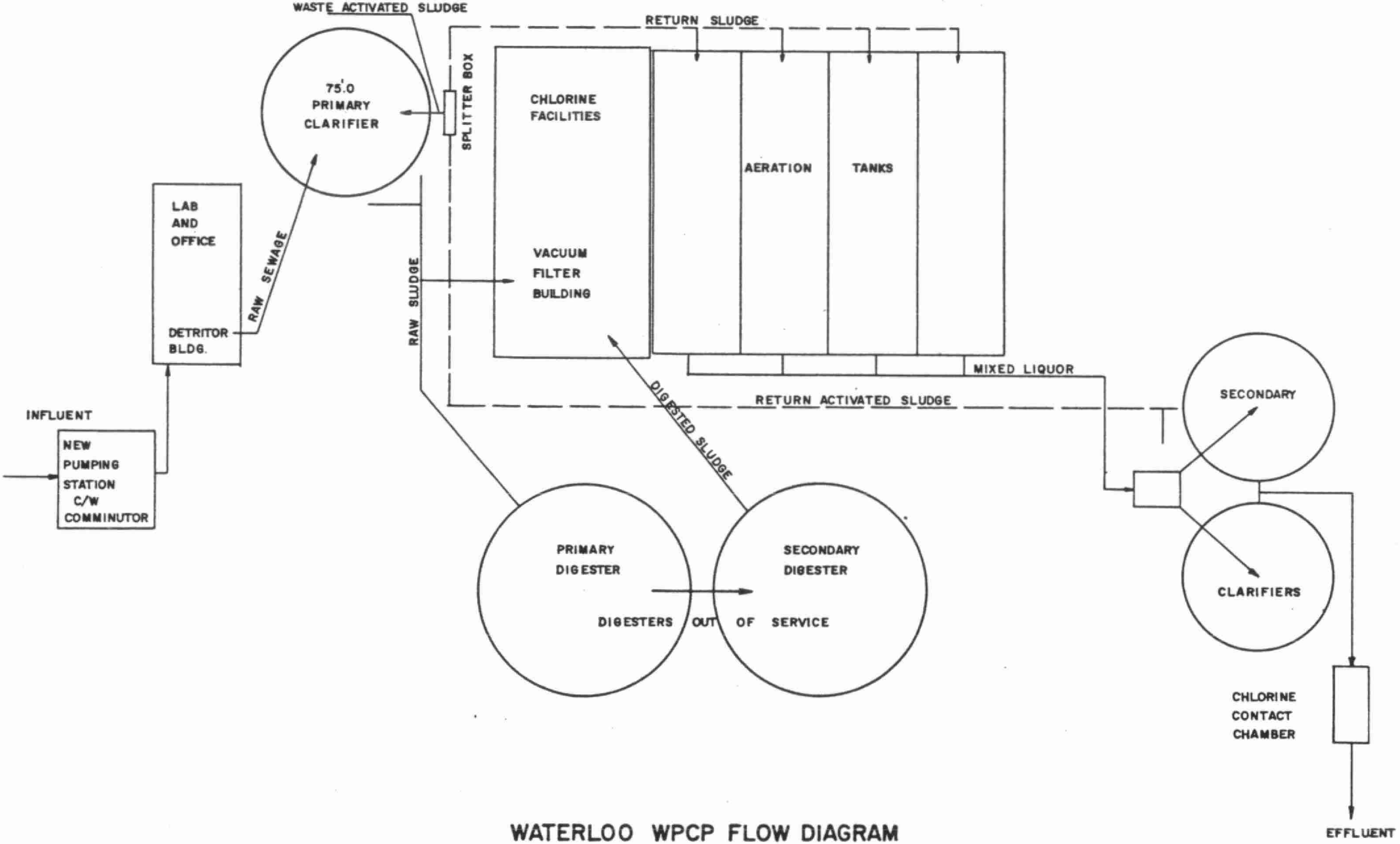


1964 OPERATING COSTS



TOTAL ANNUAL COST
(BOTH STAGES)

Technical Section



WATERLOO WPCP FLOW DIAGRAM

Design– Data

GENERAL

Type of Plant - Activated sludge.

Design Population - 20,000.

Design Plant Flow - 4.0 MGD.

Per Capita Flow - 200 GPCD

Five Day BOD -

Raw Sewage	-	300 PPM
Removal	-	90%

Suspended Solids -

Raw Sewage	-	270 PPM
Removal	-	90%

PRIMARY TREATMENT

Screening

Dorr-Oliver mechanically cleaned bar screen.

Grit Removal

12 ft. square concrete grit chamber with Dorr-Oliver mechanical raking mechanism.

PRIMARY CLARIFICATION

One 75 ft. diameter concrete clarifier with Link Belt scraping and skimming mechanism.

Detention time - 1.66 hours @ 4.0 MGD.

SECONDARY TREATMENT

Aeration Section

Four concrete tanks 136 ft. x 30 ft. with a 15 ft. side wall depth. Air supplied from two Sutorbilt rotary compressors each rated at 3,750 cubic ft. per minute. Air supplied through 264 Walker spargers in the aeration tanks on 2 ft. c/c spacings.

Final Settling Tanks

Two 65 ft. diameter concrete tanks with 10 ft. side wall depth equipped with Dorr-Oliver scraping mechanism.

Detention time - 2.75 hours @ 4.0 MGD.

Vacuum Filtration

One 300 square ft. Komline-Sanderson stainless steel coil spring filter, together with a 13" HG vacuum pump and associated chemical storage and mixing facilities.

Chlorination

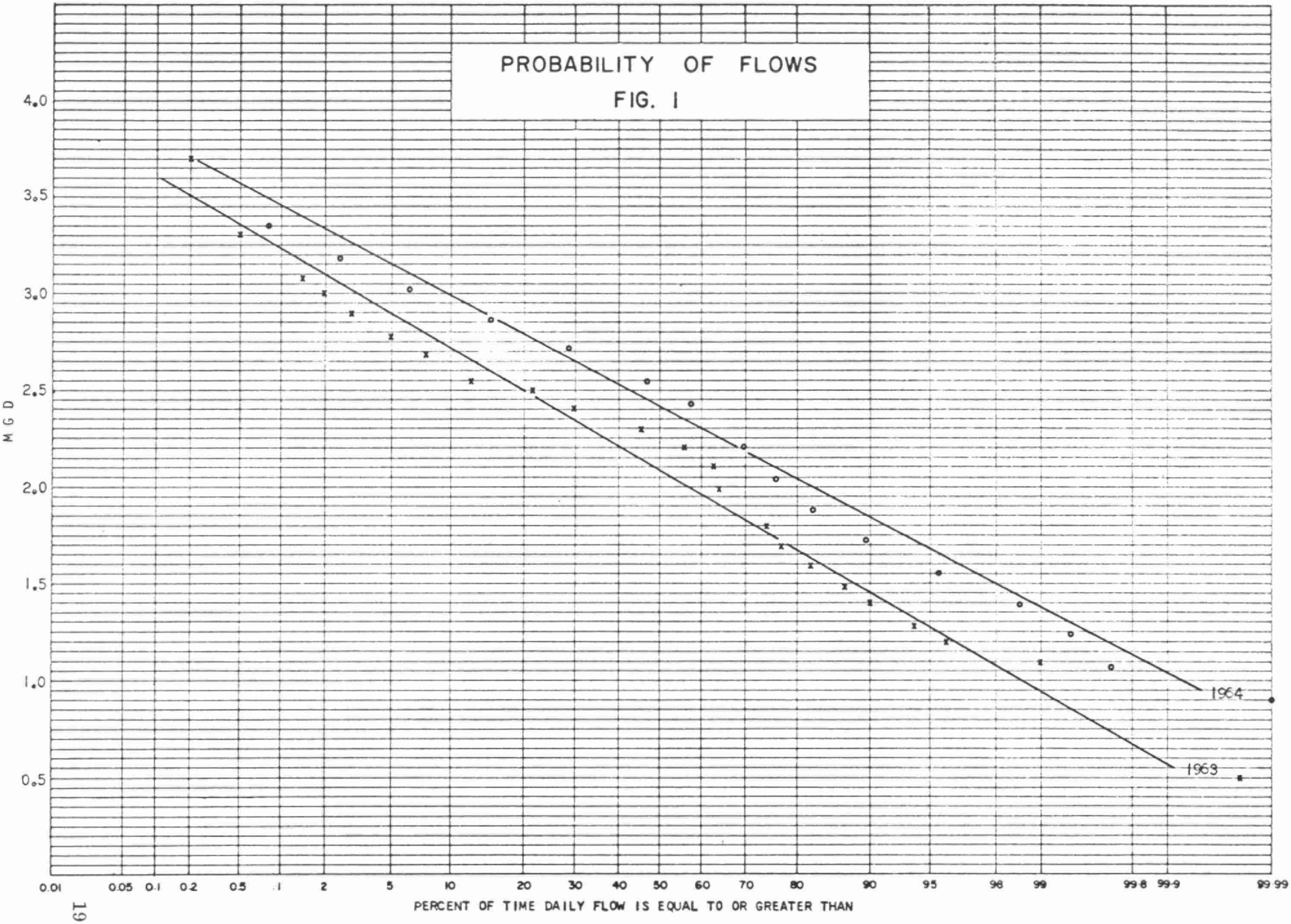
One B. I. F. 400 pounds per day chlorinizer.

Process Data

The total daily flows averaged for the month for the period January 1960 to December 1964 are shown on Figure No. 2. The average daily flow and the total flow for the year during 1964 were slightly greater than the 1963 flow. The average daily flow during 1964 was 2.34 million gallons, an increase of 12.0 percent over the average of 2.09 million gallons per day received during 1963. During the past year, 852.94 million gallons of raw sewage composed of both domestic and industrial wastes received complete treatment.

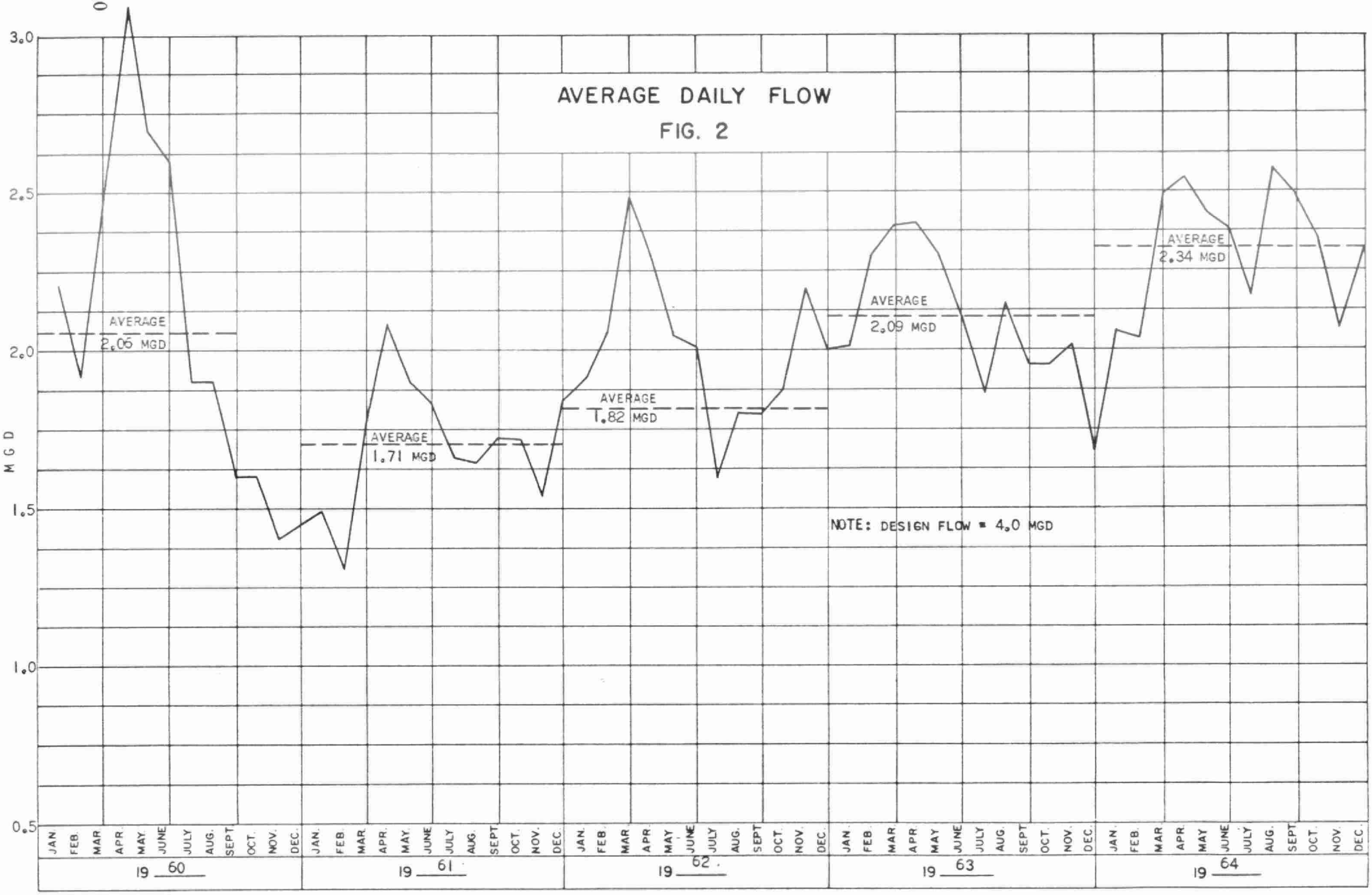
The maximum 24 hour flow during 1964 was 3.73 million gallons and occurred in the month of August. The maximum average daily flow for one month occurred in August and was 2.58 million gallons per day. An average daily flow for a month of 2.55 mgd was also recorded in April producing the two peaked curves shown on Figure No. 2. The minimum average daily flow for a month occurred in February and was 2.05 mgd.

From figure No. 1, it can be seen that the average daily flows for 1964 did not exceed the design flow of 4.0 mgd. It may also be seen from this graph that the flow received at the plant during 1964 was equal to or greater than 3 mgd only 10 percent of the time.



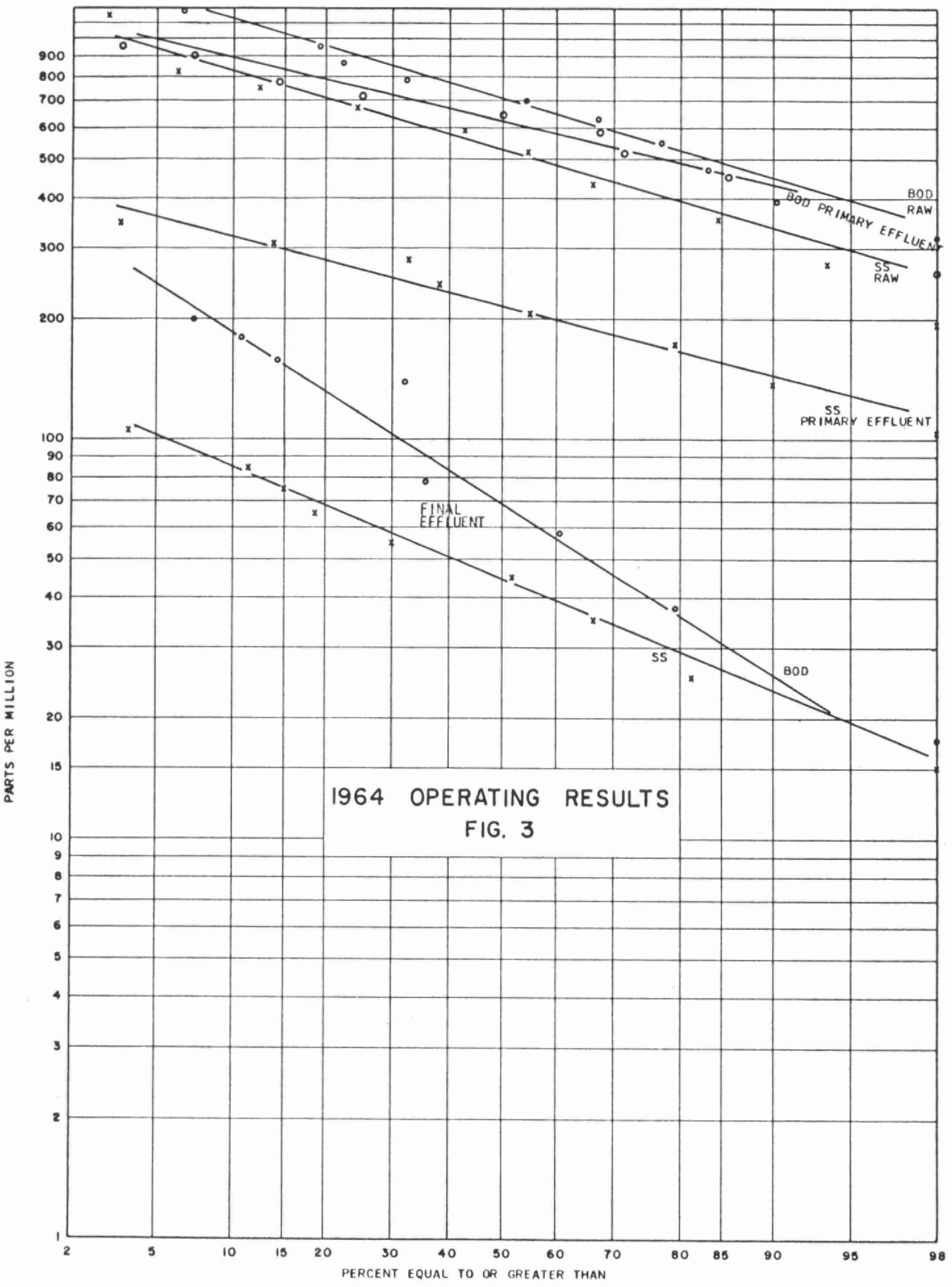
PROBABILITY OF FLOWS

FIG. 1

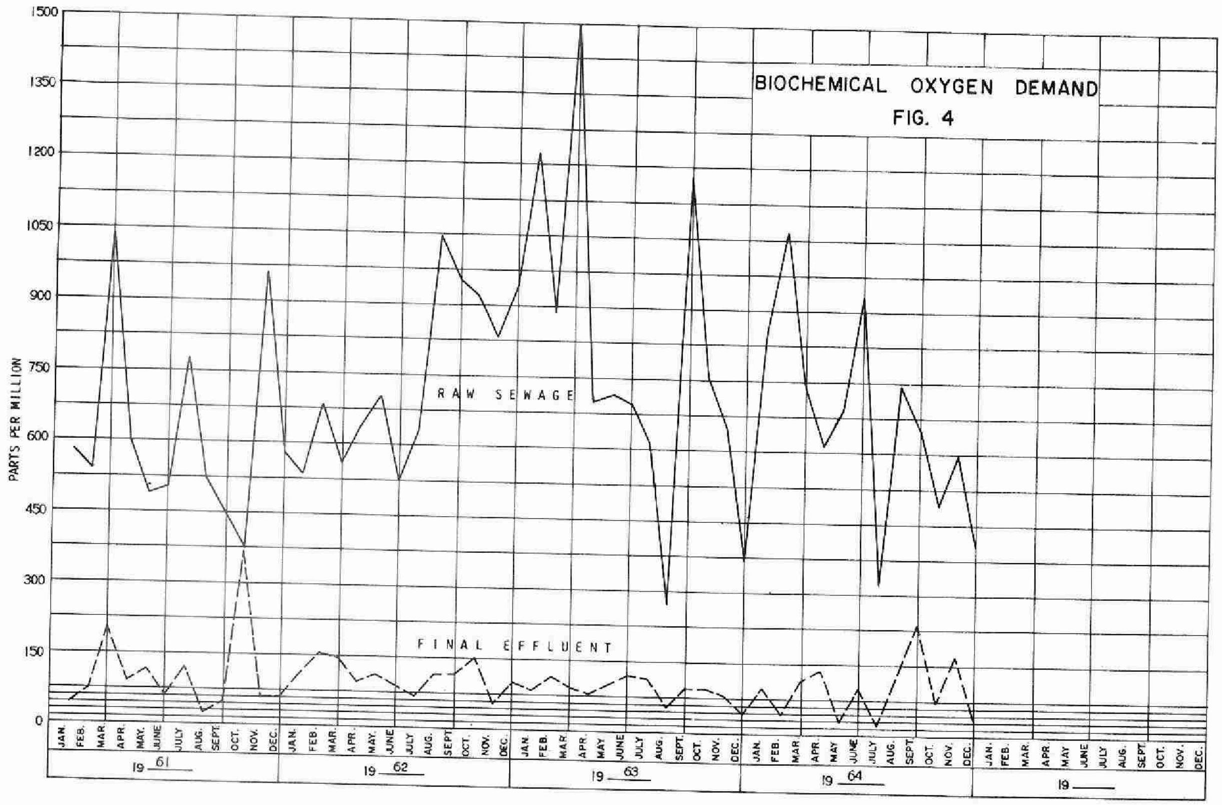


AVERAGE DAILY FLOW

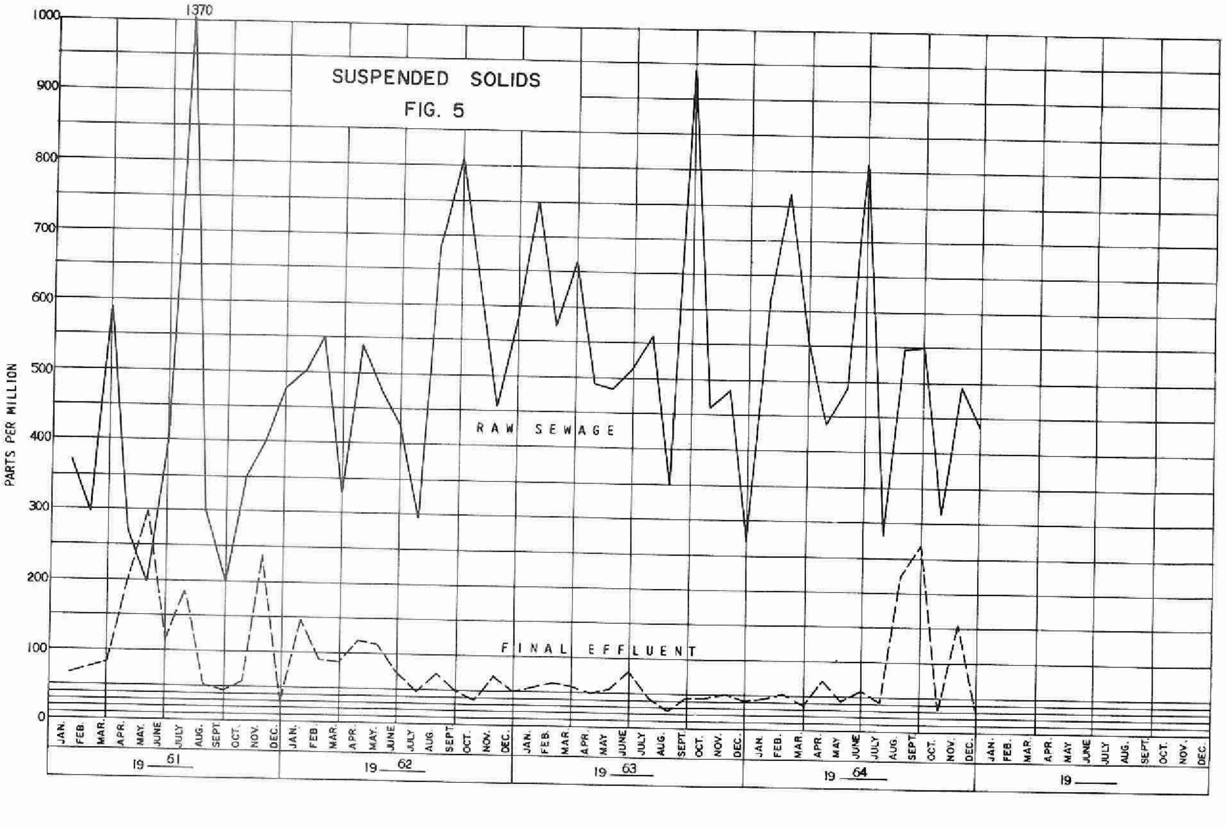
FIG. 2



1964 OPERATING RESULTS
FIG. 3


BIOCHEMICAL OXYGEN DEMAND
FIG. 4

MONTHLY VARIATIONS


SUSPENDED SOLIDS
FIG. 5

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	850	99	88.5	240.8	614	46	92.5	182.1	25.5
FEB.	1080	43	96	309.3	770	62	92	211.1	33.5
MAR.	740	113	84.5	242.4	561	37	93.5	202.6	47.5
APR.	615	136	78	183.8	440	71	84	141.6	127.5
MAY	690	29	95.5	249	490	43	91	168.4	52
JUNE	933	98	89.5	298.9	814	59	92.5	270.3	36
JULY	317	23	92.5	99.1	282	43	84.5	80.5	47.5
AUG.	743	130	82.5	244.6	547	228	58.5	127.3	72.5
SEPT.	653	236	64.0	155.8	550	270	51.0	104.6	49.0
OCT.	494	71	85.5	154.4	312	34	89.0	101.5	62.0
NOV.	595	168	71.5	131.9	492	153	69.0	104.8	40.0
DEC.	397	32	92.0	130.3	436	18	96.0	149.2	62.5
TOTAL	-	-	-	2465.0	-	-	-	1863.7	655.5
AVG.	676	98	85.5	205.4	526	89	83.0	155.3	54.6

GRIT, B.O.D AND S.S. REMOVAL

The BOD and suspended solids concentrations are based on 8 hour composite samples collected at regular weekly intervals. The BOD and suspended solids concentrations of the raw sewage, primary effluent and final effluent are presented on a probability plot in figure No. 3. The influent and effluent BOD and suspended solids averaged for the month are plotted on an arithmetic basis on figure 4 and 5 respectively.

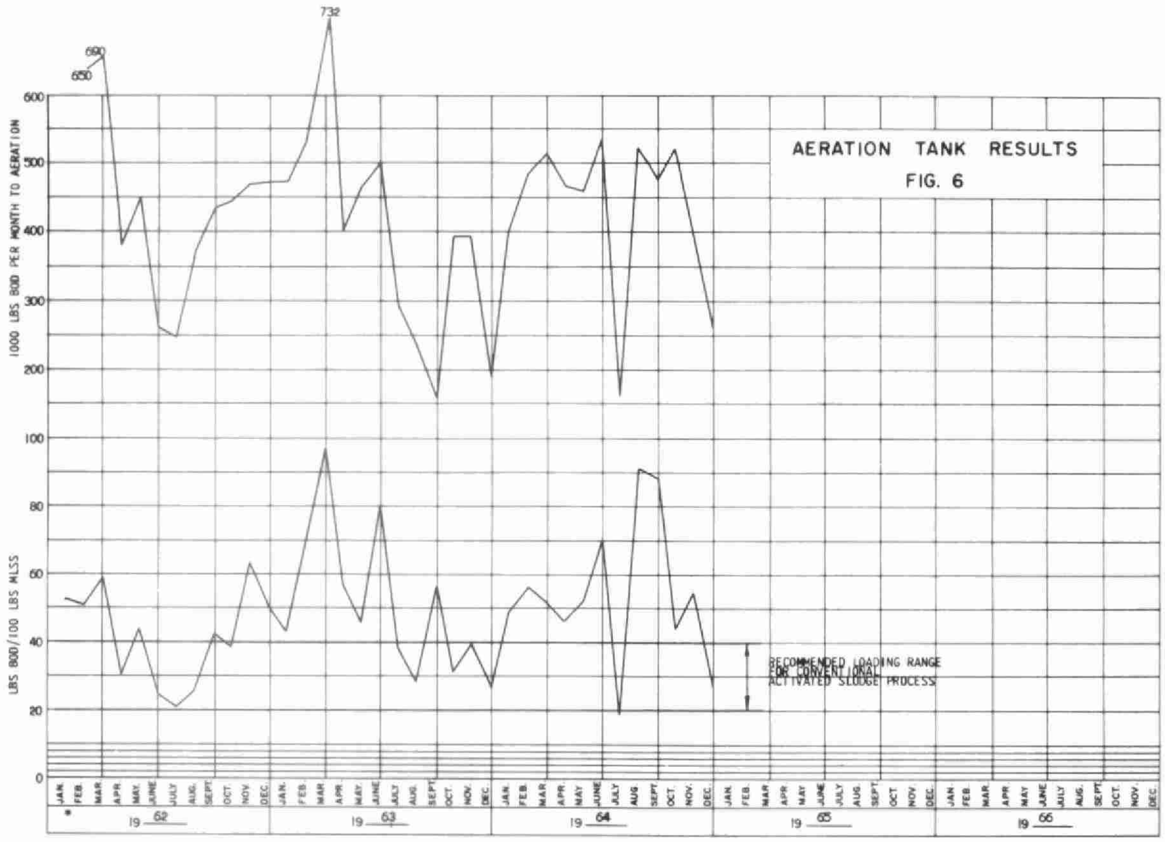
The average BOD loading of 676 ppm is 2.25 times greater than the design loading of 300 ppm. Inspection of figures 3 and 4 indicates that the raw sewage BOD concentration exceeded the plant design 100% of the time. A total of 2465 tons of BOD were removed in 1964 producing an average BOD reduction of 85.5%.

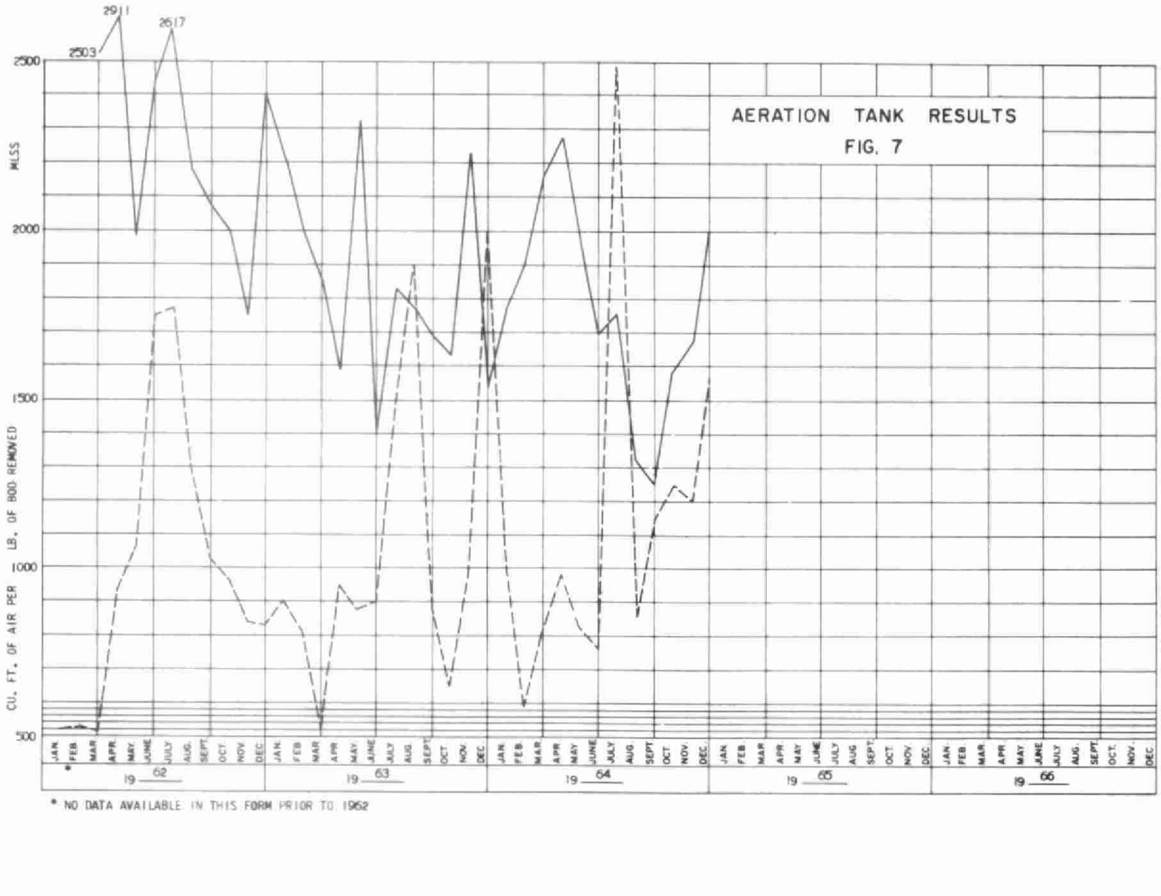
The average final effluent BOD of 98 ppm is 6.6 times greater than the OWRC objective of 15 ppm. The final effluent BOD concentration exceeded this objective 100% of the time.

The average suspended solids concentration of 526 is almost twice as great as the design concentration of 270 ppm. It can be seen that the raw sewage suspended solids concentration exceeded the plant design 97% of the time. A total of 1864 tons of suspended solids were removed in 1964 producing an average suspended solids reduction of 83.1%.

The average final effluent suspended solids of 89 ppm is 6 times greater than the OWRC objective of 15 ppm. The final effluent suspended solids concentration exceeded this objective 100% of the time.

A total of 565.5 cu. ft. of grit was removed during the year. This is equivalent to 0.77 cu. ft. per million gallons of sewage treated.


AERATION TANK RESULTS
FIG. 6


AERATION TANK RESULTS
FIG. 7

* NO DATA AVAILABLE IN THIS FORM PRIOR TO 1962

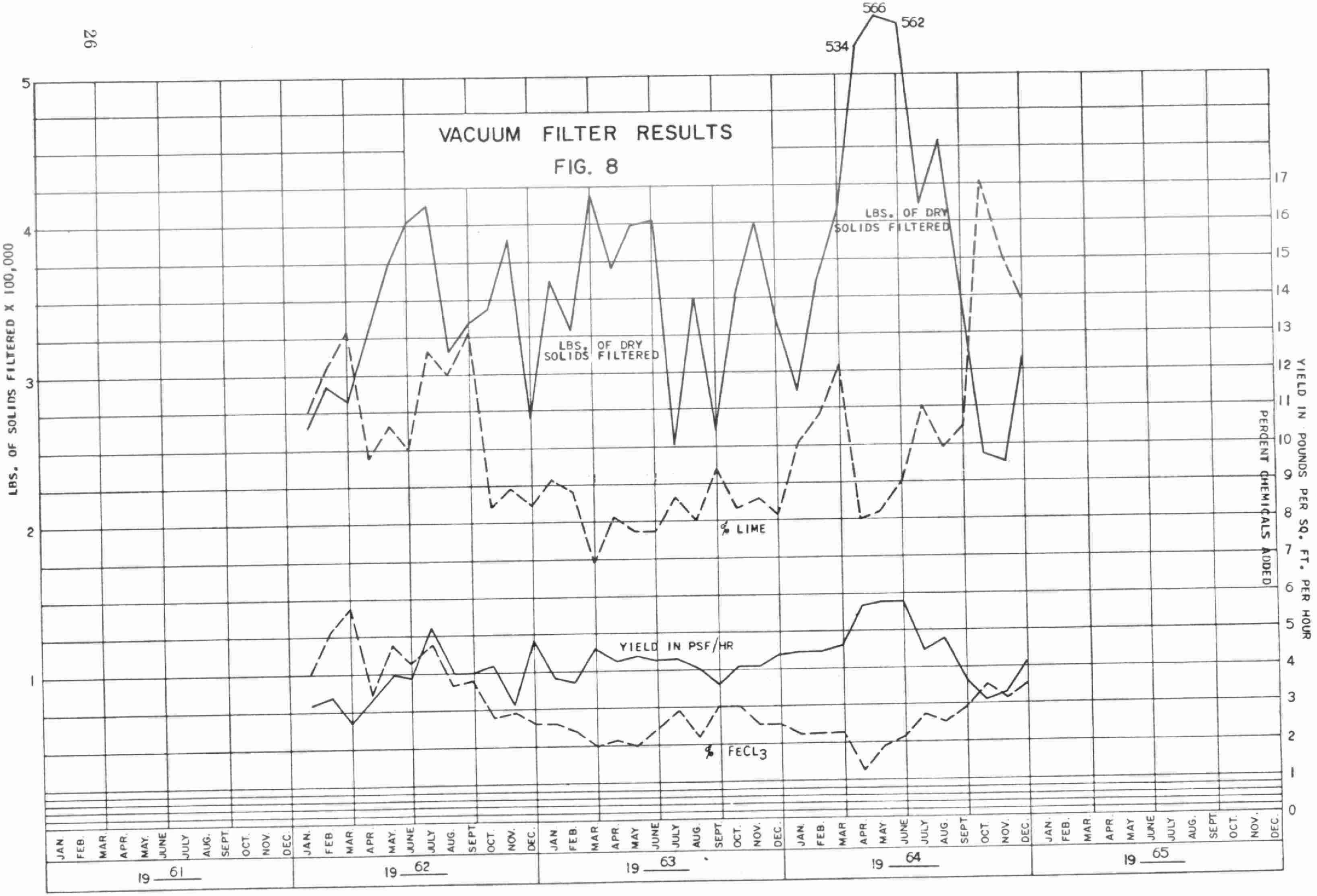
AERATION SECTION

MONTH	PRIM. EFFL B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. B.O.D. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	630	1780	49	928
FEBRUARY	820	2018	56	580
MARCH	670	2165	52	762
APRIL	615	2279	46	905
MAY	615	1957	52	777
JUNE	757	1693	69	733
JULY	239	1757	19	2488
AUGUST	659	1282	91	800
SEPTEMBER	643	1186	89	1057
OCTOBER	446	1589	44	1187
NOVEMBER	652	1676	54	1126
DECEMBER	360	1984	26	1586
TOTAL	-	-	-	-
AVERAGE	592	1780	54	1077

COMMENTS

The average primary effluent BOD of 592 ppm was 9.2 percent lower than the average primary effluent BOD in 1963 of 652 ppm. The combined factors of high BOD loading and inadequate air supply resulted in an average pounds of BOD per 100 pounds of MLSS of 54 which is greater than the recommended value of 50. The total air compressor capacity is being supplied to the aeration section twenty-four hours per day. The bio-sorption process was used for most of the year to obtain maximum treatment efficiency.

The pounds of BOD per month to the aeration section and the average monthly pounds of BOD per 100 pounds of MLSS are plotted in figure No. 6. In addition the average monthly MLSS concentration and the average monthly cubic feet of air per pound of BOD removed are plotted in figure No. 7.



VACUUM FILTER RESULTS

FIG. 8

MONTH	FILTER HOURS		% SOLIDS DIGEST SLUDGE	LBS. DRY SOLIDS FILTERED	LBS. LIME	% LIME	LBS. $FeCl_3$	% $FeCl_3$	% SOLIDS FILTERED SLUDGE	YIELD PSF/HOUR
	#1	#2								
JAN.	201.5	-	5.9	284829	28750	10.1	6315	2.22	-	4.5
FEB.	261.0	-	5.6	359912	38900	10.8	8008	2.22	-	4.5
MAR.	298.5	-	5.6	407792	49350	12.1	10125	2.48	-	4.6
APR.	307.0	-	6.4	534672	42900	8.0	6525	1.22	-	5.7
MAY.	322.0	-	6.8	566334	46450	8.2	10588	1.87	-	5.8
JUNE	330.5	-	6.3	561927	50850	9.0	12024	2.14	-	5.8
JULY	305.6	-	6.0	411761	45300	11.0	11298	2.74	-	4.5
AUG.	297.5	-	6.0	453176	44800	9.9	11490	2.54	-	4.8
SEPT.	239.0	-	4.7	345037	36400	10.5	10033	2.90	-	3.7
OCT.	258.5	-	3.7	243933	41750	17.1	8624	3.50	-	2.1
NOV.	236.0	-	4.2	238186	35900	15.1	7794	3.27	-	3.3
DEC.	252.0	-	4.8	311529	42900	13.8	11005	3.53	-	4.1
TOTAL	3309.1	-	-	4719088	504250	-	113829	-	-	-
AVG.	275.8	-	5.5	393257	42021	10.7	9486	2.41	-	4.5

VACUUM FILTER OPERATION

During 1964, the filter was operated about 276 hours per month or 65 hours per week and 2360 tons of dry solids were filtered. Using an average solids content of 15 percent in the filtered sludge, this weight of dry solids represents 15,733 tons of sludge which was hauled away by truck.

Assuming the filtered sludge solids content is 15 percent, the moisture content of the sludge was reduced from 95 percent to 85 percent by the vacuum filter. This represents a 66 percent reduction in the volume of sludge to be hauled.

The feric chloride and lime dosages are within the ranges reported by others for this type of sludge. The yield also compares favourably with those of other plants and is indicative of an efficient filter operation.

The pounds of dry solids filtered per month, the dosage of lime and ferric chloride, and the average monthly filter yield in pounds per square foot per hour are plotted in figure No. 8.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (P.P.M.)
JANUARY	64.130	4874	7.60
FEBRUARY	59.649	4564	7.65
MARCH	77.322	4591	5.94
APRIL	76.755	6110	7.96
MAY	75.353	5565	7.38
JUNE	71.602	7735	10.80
JULY	67.394	7862	11.67
AUGUST	79.814	8820	11.05
SEPTEMBER	74.721	8778	11.75
OCTOBER	73.018	8195	11.22
NOVEMBER	61.799	6280	10.16
DECEMBER	71.380	5690	7.97
TOTAL	852.937	79064	-
AVERAGE	71.078	6589	9.27

COMMENTS

The average chlorine dosage rate was 9.27 ppm. This is higher than is normally expected in a complete treatment plant. However due to the high BOD in the final effluent, it was necessary to maintain a higher dosage rate to obtain a chlorine residual of 0.5 ppm after a 15 minute contact period.

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RECOMMENDATIONS

This report has demonstrated, as have those in the past, the extremely overloaded condition the plant is forced to operate under. Consequently, it is recommended that the plant be enlarged as soon as possible.

CONCLUSIONS

The plant operated as efficiently as could be expected under the prevailing conditions.

ONTARIO WATER RESOURCES COMMISSION